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**LESSON PLAN 16  
Conversion Kit  
TWGSS Training Device 17-172/1, 2**

**Operator Training Course  
For  
Tank Weapon Gunnery Simulation System (TWGSS)**

**PREPARED FOR  
  
SIMULATION, TRAINING AND INSTRUMENTATION COMMAND  
12350 RESEARCH PARKWAY  
ORLANDO, FLORIDA 32826-3276**

**PREPARED BY  
  
SAAB TRAINING SYSTEMS AB  
561 85 HUSKVARNA  
SWEDEN**

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**DISTRIBUTION STATEMENT:**

**Approved for public release; distribution is unlimited.**

## **CHAPTER 16**

### **CONVERSION KIT**

### **LESSON PLAN 16**

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#### **METHOD:**

Conference, demonstration, and practical exercise

#### **TIME ALLOTTED:**

2.0 hours

#### **COURSE PRESENTED TO:**

- a. TSC personnel
- b. Unit NCOs

#### **TOOLS, EQUIPMENT, AND MATERIALS:**

See Appendix A

#### **PERSONNEL:**

- a. Primary instructor
- b. Assistant instructor

#### **INSTRUCTIONAL AIDS:**

- a. Overhead projector
- b. Viewgraphs (Appendix B)

#### **REFERENCES:**

- a. TM 9-6920-709-12&P-1-1
- b. TM 9-6920-709-12&P-1-2
- c. TD 17-6920-712

#### **APPENDICES:**

- Appendix A. Tools, Equipment, and Materials
- Appendix B. Viewgraphs

## 16-1. INTRODUCTION.

(5 minutes)

Note. Show Slide 1.

- a. **Reason.** An M1/M1A1 TWGSS may be used on an M1A2 tank through the use of a conversion kit. This lesson provides the procedures to prepare equipment prior to use on an M1A2 tank. This knowledge will allow TSC personnel and unit NCOs to make the most of available TWGSS resources.

Note. Show Slide 2.

- b. **Training Objective.** In a classroom environment, given an M1/M1A1 TWGSS and conversion kit, you will perform the following:
  - (1) Inspect items prior to issue/use.
  - (2) Convert an M1/M1A1 TWGSS to an M1A2 TWGSS.
  - (3) Convert an M1A2 TWGSS to an M1/M1A1 TWGSS.
- c. **Procedures.** During this block of instruction, we will cover how to convert an M1/M1A1 TWGSS to an M1A2 TWGSS and how to convert an M1A2 TWGSS back to an M1/M1A1 TWGSS. You will have an assistant instructor for the practical exercise portion of this class.

## 16-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE. (100 minutes)

Notes.

- 1. The primary instructor will release the students to their assigned assistant (small group) instructors for the practical exercise portion of this lesson.
- 2. Demonstrate each item to the students while discussing the function.
- 3. Demonstrate each item identification label with part number.

- a. **Presentation of Conversion Kit.** The conversion kit is packed in a one-man-lift storage case and contains all parts required to convert an M1/M1A1 TWGSS to an M1A2 TWGSS. The kit consists of:
  - (1) **Expansion Unit Assembly M1A2.** The M1A2 tank has a more complex fire control system. In order for TWGSS to interface to this fire control system an additional interface component is needed. This component contains the electronics needed to communicate with the 1553 data bus of the tank. The expansion unit is installed in a bracket.
  - (2) **Node M1A2 FCEU/TJ2 (W11 cable assembly).** This assembly is connected to Test Jack 2 of the tank and interfaces TWGSS with the W11 and is part of the vehicle interface between TWGSS and the tank. This component allows TWGSS to sense the sight mirror position within the GPS and accurately simulate the Tracer, Burst, Obscuration Simulation (TBOS) effects into the sight.

## 16-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE (Con't).

- (3) **Node M1A2 FCEU/J12.** This assembly is connected to W11 and is part of the vehicle interface between TWGSS and the tank fire control system. This component allows TWGSS to interface with the range data bus of the tank (connector J12 on FCEU).
- (4) **System cables.** Six (6) cables are needed to interface M1/M1A1 TWGSS with different connection points in the tank:
  - (a) W9 power cable, M1A2
  - (b) W10 cable, loader's panel, M1A2
  - (c) W13 cable, expansion unit
  - (d) W14 cable, 1553 Bus A
  - (e) W15 cable, 1553 Bus B
  - (f) W16 cable, trigger

Note. Demonstrate Chapter 3, PMCS of conversion kit manual.

### b. Before Operation Preventive Maintenance Checks and Services (PMCS).

- (1) **General PMCS procedures.** If any deficiencies are discovered during visual inspection, ensure you:
  - (a) Consult TD 17-6920-712, Chapter 3, to determine if component is considered Not Mission Capable (NMC).
  - (b) Tag component with the problem discovered.
  - (c) Report failure on DA form 2404.
  - (d) Return component to TSC.
  - (e) TSC report failure to higher level maintenance using DA Form 2407.
- (2) **General inspection checks.** Perform the following general inspection checks on all conversion kit components.
  - (a) Visually inspect components for damaged or missing parts.
  - (b) Inspect connectors for damage, foreign objects, and bent or damaged pins.
  - (c) Inspect outer shield of all cables for damage and cuts.
  - (d) Verify all decals and markings are present and legible.
- (3) **Visual Inspection of components.**
  - (a) Expansion unit assembly.
    - 1. Check that moisture indicator color is pale blue or white. Pale pink indicates moisture.
    - 2. Inspect strap and bracket for damage and missing parts.



## 16-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE (Con't).

- (b) Node Assembly M1A2 FCEU/J12 and Node Assembly M1A2 FCEU/TJ2 (W11 cable). Inspect for damage and missing dust caps.

Note. Direct students to TM 9-6920-709-12&P-1-1, Chapter 3.

- (4) **TWGSS General inspection checks.** Perform M1/M1A1 TWGSS PMCS IAW TM 9-6920-709-12&P-1-1, prior to conversion to M1A2 TWGSS.

Notes.

- 1. Place M1/M1A1 TWGSS storage cases and conversion kit storage case on floor.
- 2. Refer to TD 17-6920-712, Chapters 2 and 3.
- 3. Refer to Figure 1.

### c. Conversion of M1/M1A1 TWGSS to M1A2 TWGSS.

#### (1) **Remove M1/M1A1 cables from vehicle interface assembly.**

- (a) Remove vehicle interface assembly from TWGSS storage case 2 of 2, position 8 and place on floor.
- (b) Uncoil and separate all cables for easy identification.
- (c) Disconnect W10 cable(PN: 8839136-311) connector J4 from vehicle interface unit connector J3.
- (d) Disconnect W9 cable(PN: 8839132-311) connector J4 from vehicle interface unit connector J3.
- (e) Verify that W3, W4, and W8 cables are properly secured.

#### (2) **Installation of units and cables to vehicle interface assembly, M1A2.**

- (a) Remove the following items from the conversion kit:
  - 1. M1A2 expansion unit (PN: 8852010-102)
  - 2. M1A2 expansion unit bracket (PN: 8854109-101)
  - 3. M1A2 W9 power cable (PN: 8839132-341)
  - 4. M1A2 W10 cable, loader's panel (PN: 8839136-341)
  - 5. Expansion unit W13 cable (PN: 8839130-341)

## 16-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE (Con't).

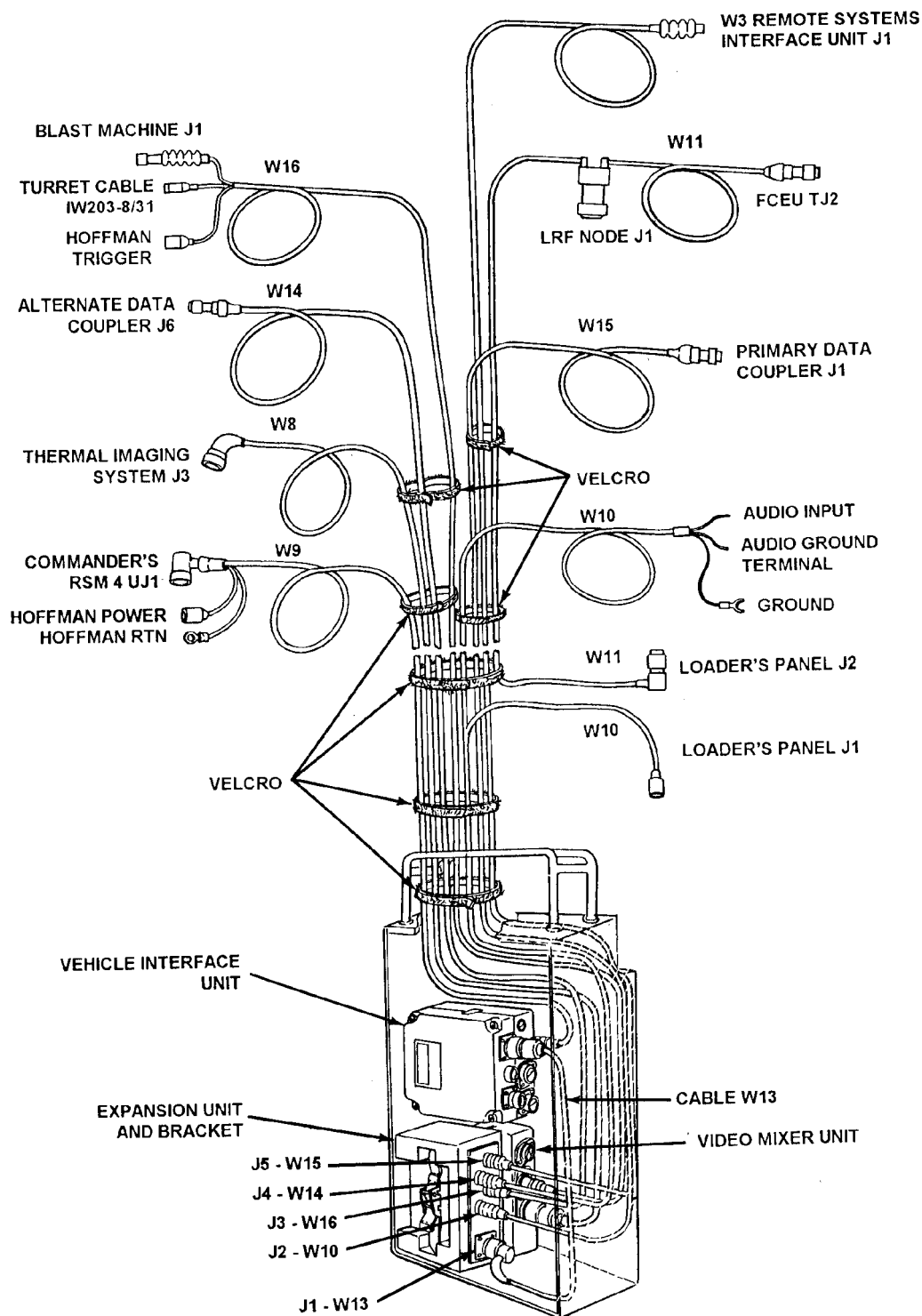


Figure 1. Conversion of M1/M1A1 TWGSS to M1A2 TWGSS.

## **16-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE (Con't).**

6. W14, Cable 1553 Bus A (PN: 8839141-341).

7. W15, Cable 1553 Bus B (PN: 8839142-341).

8. W16, Cable trigger (PN: 8839140-341).

*\*Note: Placed inside of bracket expansion unit.*

- (b) Install the expansion unit to the expansion unit bracket if separated during PMCS.
- (c) Install the expansion unit bracket to the video mixer unit using the expansion unit bracket straps.
- (d) Locate cable bundle of conversion kit containing cables W10, W11 and W15.

Note. Cables should be routed into the vehicle interface assembly through the lower opening at the top off the assembly.

- (e) Connect cable W15, cable 1553 Bus B (PN: 8839142-341) to expansion unit connector J5.
- (f) Connect W10 connector J2 to expansion unit connector J2.
- (g) Locate cable bundle of conversion kit containing cables W9, W14 and W16.
- (h) Connect cable W14, cable 1553 Bus A (PN: 8839141-341) to expansion unit connector J4.
- (i) Connect cable W16, cable trigger (PN: 8839140-341) to expansion unit connector J3.
- (j) Connect W9 cable connector J3 (PN: 8839132-341) to vehicle interface unit J3.
- (k) Connect cable W13, cable expansion unit (PN: 8839130-341) between expansion unit connector J1 and vehicle interface unit connector J4.

### **(3) Cable arrangement and cable strapping, vehicle interface assembly.**

- (a) Separate and straighten all cable bundles coming out of vehicle interface assembly.

Note. Cables will be collected into two cable bundles, one leading behind the commander's seat and the other leading above the ammunition door around the loaders position.

- (b) Gather the following cables into one bundle: W8, W9, W14, W16. Ensure cables are straight.
- (c) Strap the cables together using Velcro straps. Place a strap at every foot starting at assembly.
- (d) Gather the following cables into one bundle: W3, W10, W11 and W15. Ensure cables are straight.
- (e) Strap the cables together using Velcro straps.
- (f) Secure both cable bundles to the vehicle interface assembly using a Velcro strap. Secure bundles to the hole located on the left side at the top of the assembly.

## **16-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE (Con't).**

- (g) Gather the cable bundles together, coil and place them in the vehicle interface assembly.

### **(4) Assembly of converted TWGSS kit.**

- (a) Remove W11 cable assembly (PN 8839131-311) from M1/M1A1 TWGSS storage case 2 of 2, position 8. Place W11 cable harness in conversion kit storage case.
- (b) Remove turret position sensor from TWGSS storage case 1 of 2, position 8. Place turret position sensor in conversion kit storage case.
- (c) Place W9 and W10 of M1/M1A1 TWGSS in conversion kit storage case.
- (d) Position vehicle interface assembly in TWGSS storage case 2 of 2, position 8.
- (e) Place node assembly M1A2 FCEU/J12 (PN: 8851020-101) in TWGSS storage case 2 of 2, position 8.
- (f) Place Node assembly M1A2 FCEU/ TJ2 (PN: 8839131-341) in TWGSS storage case 2 of 2, position 8.
- (g) Replace M1/M1A1 manual TM 9-6920-709-12&P-1-1 with M1A2 manual TM 9-6920-709-12&P-1-2. Place M1/M1A1 manual in conversion kit storage case.
- (h) Close and secure latches on storage cases.

### **d. Restore M1A2 TWGSS to M1/M1A1 TWGSS.**

- Notes.
- 1. Set removed items by vehicle interface assembly for later packaging.
  - 2. Refer to TD17-6920-712, Chapter 2.
  - 3. Refer to Figure 2.

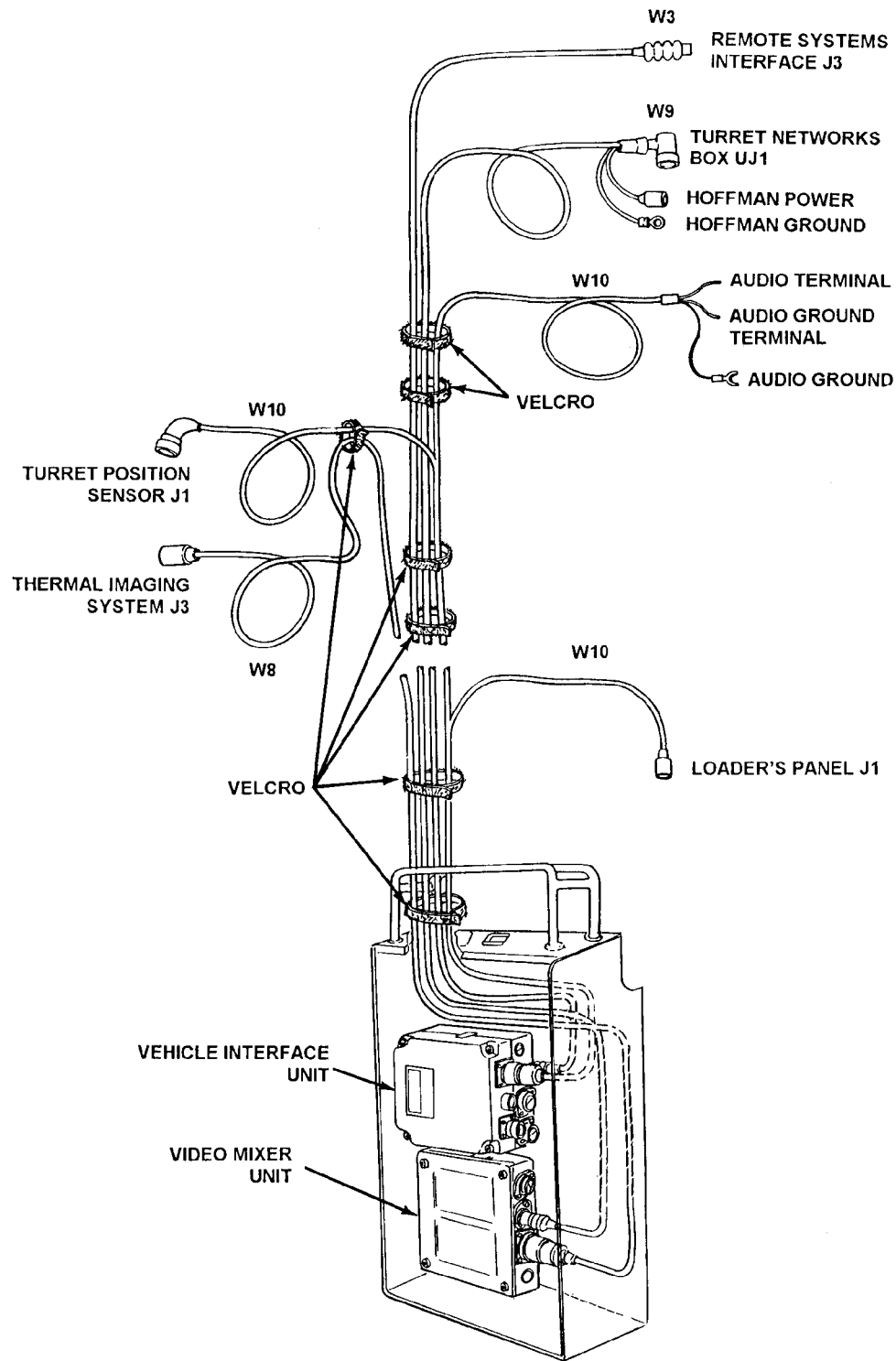
### **(1) Removal from M1A2.**

- (a) Remove vehicle interface assembly from TWGSS storage case 2 of 2, position 8.
- (b) Uncoil and straighten all cables.
- (c) Remove velcro straps and separate cables for easy identification.

- Note. Set cables aside after removal for later packaging.

- (d) Disconnect W13 cable (PN: 8839130-341) connector J1 from expansion unit connector J1 and W13 cable connector J4 from vehicle interface unit connector J4.
- (e) Disconnect W10 cable (PN: 8839136-341) connector J2 from expansion unit connector J2.
- (f) Disconnect W15 cable (PN: 8839142-341) connector J5 from expansion unit connector J5.
- (g) Coil cable bundle containing W10, W11, and W15 cables and set aside.

**16-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE (Con't).**



**Figure 2. Restore M1A2 TWGSS to M1/M1A1 TWGSS.**

## **16-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE (Con't).**

- (h) Disconnect W14 cable (PN: 8839141-341) connector J4 from expansion unit connector J4.
- (i) Disconnect W16 cable (PN: 8839140-341) connector J3 from expansion unit connector J3.
- (j) Disconnect W9 cable (PN: 8839132-341) connector J3 from vehicle interface unit connector J3.
- (k) Remove and coil cable bundle containing W9, W14, and W16 cables and set aside.
- (l) Release strap and expansion unit assembly from video mixer unit.

### **(2) Restore to M1/M1A1.**

- (a) Remove the following items from the conversion kit:
  - 1. W9 power cable, M1/M1A1 (PN: 8839132-311).
  - 2. W10 cable, loader's panel, M1/M1A1 (PN: 8839136-311).
  - 3. W11 cable, node assembly (PN: 8839131-311).
  - 4. Turret position sensor (PN: 8839015-101).
  - 5. TM 9-6920-709-12&P-1-1.
- (b) Connect W9 cable (PN: 8839132-311) connector J3 to vehicle interface unit connector J3. Run cable out of assembly.
- (c) Connect W10 cable (PN: 8839136-311) connector J4 to vehicle interface unit connector J4. Run cable out of assembly.
- (d) Ensure W3, W4, and W8 cables are properly connected.
- (e) Separate and straighten cables for easy identification.

Note. Cables are collected into two bundles; one bundle routed behind commander's seat and one bundle routed above ammunition door around loader's position.

- (f) Bundle W8 and W10 (connector end labeled *Turret Position Sensor*) cables. Ensure that cables are straight and secure with velcro straps.
- (g) Bundle W3, W10 (end leading to radio set 1780), and W9 cables. Ensure that cables are straight and secure with velcro straps.
- (h) Secure both cable bundles to vehicle interface assembly with velcro strap using hole located on left side on top of vehicle interface assembly.
- (i) Coil cable bundles and place them on vehicle interface assembly.

### **(4) Assembly of converted TWGSS kit.**

- (a) Remove node assembly M1A2 FCEU/ TJ2 (PN: 8839131-341) from TWGSS

storage case 2 of 2 and place in conversion kit storage case.

**16-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE (Con't).**

- (b) Remove node assembly M1A2 FCEU/ J12 (PN: 8851020-101) from TWGSS storage case 2 of 2 and place in conversion kit storage case.
- (c) Place vehicle interface assembly in TWGSS storage case 2 of 2, position 8.
- (d) Place W11 cable (PN 8839131-311) in TWGSS storage case 2 of 2, position 8.
- (e) Place turret position sensor (PN: 8839015-101) in TWGSS storage case 1 of 2, position 8.
- (f) Replace M1A2 manual (TM 9-6920-709-12&P-1-2) with M1/M1A1 manual (TM 9-6920-709-12&P-1-1). Place M1A2 manual in conversion kit storage case.
- (g) Place cable bundles in box in conversion kit storage case.
- (h) Place W13 cable in conversion kit storage case.
- (i) Place conversion kit manual in conversion kit storage case.
- (j) Place expansion unit assembly in conversion kit storage case, position 1.

Note. Refer to TD 17-6920-712, Chapter 3.

e. **After Operation Preventive Maintenance Checks and Services (PMCS).**

- (1) **General PMCS procedures.** If any deficiencies are discovered during visual inspection, ensure you:
  - (a) Consult TD 17-6920-712, Chapter 3 to determine if component is considered Not Mission Capable (NMC).
  - (b) Tag component with the problem discovered, using DA Form 2402.
  - (c) Report failure on DA Form 2404.
  - (d) Return component to TSC.
  - (e) TSC report failure to higher level maintenance using DA Form 2407.
- (2) **General inspection checks.** Perform the following general inspection checks on all conversion kit components:
  - (a) Visually inspect components for damaged or missing parts.
  - (b) Inspect connectors for damage, foreign objects, and bent or damaged pins.
  - (c) Inspect outer shield of all cables for damage or cuts.
  - (d) Verify all decals and markings are present and legible.
- (3) **Visual Inspection of components.**
  - (a) Expansion unit assembly.
    - 1. Check that moisture indicators color is pale blue or white. Pale pink indicates moisture.

2.      Inspect strap and bracket for damage and missing parts.

**16-2. CONFERENCE/DEMONSTRATION/PRACTICAL EXERCISE (Con't).**

(b) Node Assembly M1A2 FCEU/J12 and Node Assembly M1A2 FCEU/TJ2 (W11 cable). Inspect for damage and missing dust caps.

(c) Storage Case.

1. Inventory conversion kit. Ensure that all items are properly stowed.

2. Close and secure conversion kit storage case.

**(4) TWGSS General inspection checks.**

(a) Perform TWGSS PMCS IAW TM 9-6920-709-12&P-1-1, Chapter 3.

(b) Close and secure TWGSS storage cases.

**16-3. FINAL REVIEW**

(5 minutes)

Note. Show Slide 3.

a. **Summary of Main Teaching Points.**

(1) Inspection of items prior to issue/use.

(2) Conversion of an M1/M1A1 TWGSS to an M1A2 TWGSS.

(3) Conversion of an M1A2 TWGSS back to an M1/M1A1 TWGSS.

Note. Show Slide 4.

b. **Closing Statement.** This block of instruction has prepared you to convert an M1/M1A1 TWGSS to an M1A2 TWGSS and convert an M1A2 TWGSS back to an M1/M1A1 TWGSS.

**APPENDIX A  
TO LESSON PLAN 16**

**CONVERSION KIT**

**TOOLS, EQUIPMENT, AND MATERIALS**

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Listed equipment is one per student, except as noted.

1. M1/M1A1 TWGSS system (one per four students)
2. Conversion kit (one per four students)
3. Sufficient working area per student station

**APPENDIX B  
TO LESSON PLAN 16**

**CONVERSION KIT**

**VIEWGRAPHS**

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